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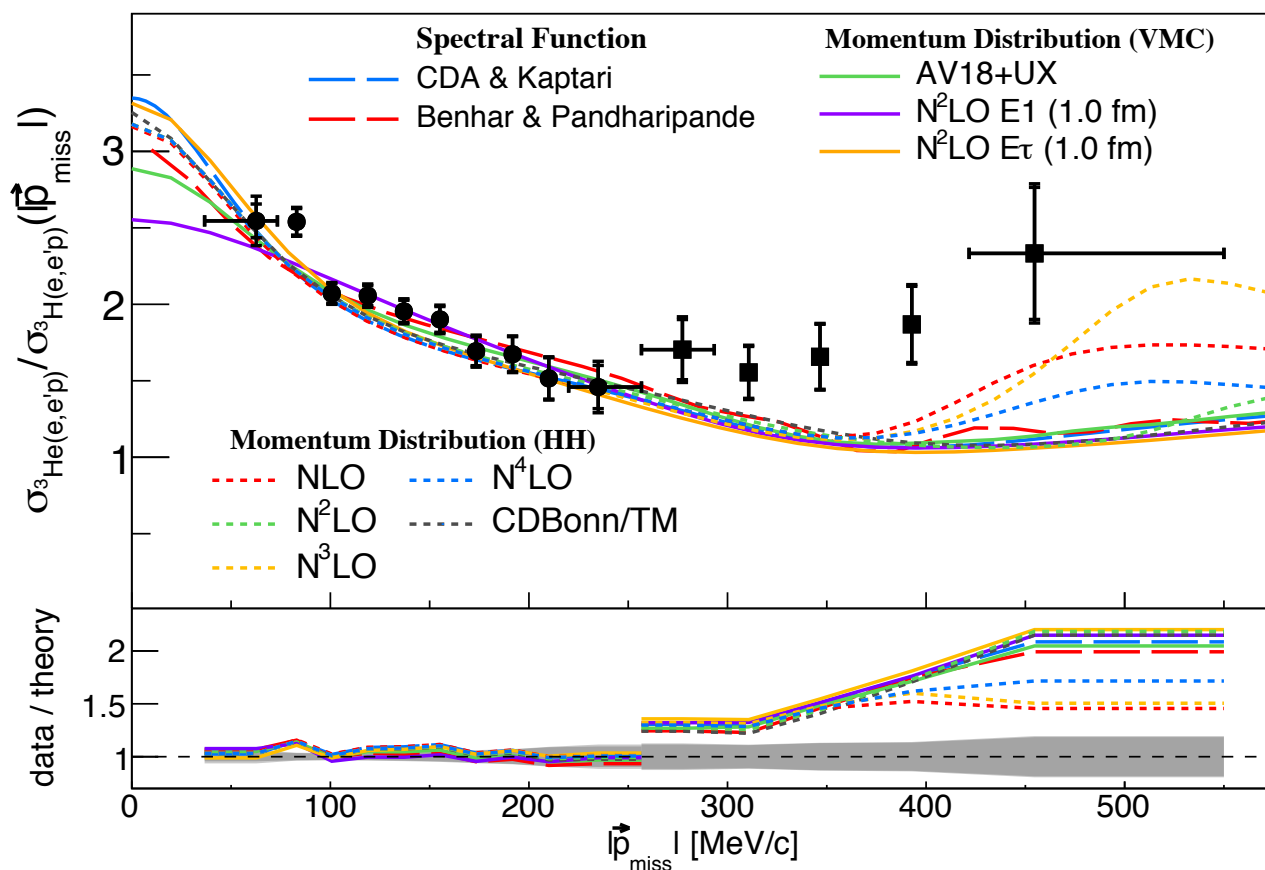
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$(e, e' p)$ study of momentum distribution ratios in $A=3$ nuclei

Objectives

- We report the first measurement of the $(e, e' p)$ reaction cross-section ratio for ${}^3\text{He}$ relative to ${}^3\text{H}$, with missing momentum range of $40 \leq p_{\text{miss}} \leq 550$ MeV/c, at large momentum transfer $\langle Q^2 \rangle \approx 1.9$ (GeV/c) 2 and $x_B > 1$.
- The data is compared with calculations performed within the plane-wave impulse approximation (PWIA) using realistic spectral functions and momentum distributions.



Extracted ${}^3\text{He}$ to ${}^3\text{H}(e, e' p)$ cross section ratio plotted vs. p_{miss} compared with different models of the corresponding momentum distribution ratio.

Impact

- The measurement of the ${}^3\text{He}(e, e' p)$ and ${}^3\text{H}(e, e' p)$ reactions is performed in kinematics where the cross-sections are expected to be sensitive to the proton momentum distribution, and two-body currents and the effects of final state interaction (FSI) are minimal.
- The measured and PWIA cross-section ratios agree within the measurement accuracy of about 3% up to the nuclear Fermi-momentum (≈ 250 MeV/c), and differ by 20%–50% at higher momenta despite a four order of magnitude decrease of the momentum distribution in this range. FSI calculations using the generalized Eikonal Approximation indicate that FSI should change the ${}^3\text{He}/{}^3\text{H}$ cross-section ratio for this measurement by less than 5%.
- The data overall supports the transition from single-nucleon dominance at low p_{miss} , towards an np -short-range-correlated pair dominant region at high p_{miss} .
- The observed difference between the ${}^3\text{He}/{}^3\text{H}$ experimental ratio and momentum distribution ratios at large p_{miss} might arise from the loosely-constrained short-distance parts of the NN interaction.

Accomplishments

R. Cruz-Torres *et al.* (Jefferson Lab Hall A Tritium Collaboration), [Phys. Lett. B 797, 134890 \(2019\)](#)